



NASA Earth Science Applied Sciences Program

**Lines of Business** 



# Innovative & Practical Applications

Develop, prove-out, and transition uses



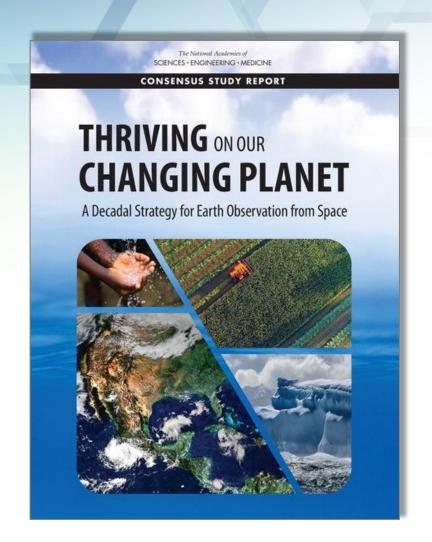
### Capacity Building

Build capabilities in US and developing countries



### Mission Planning

Support applications throughout mission lifecycle



### **NASA Earth Science**





#### EXECUTIVE OFFICE OF THE PRESIDENT WASHINGTON, D.C.



August 17, 2017

MEMORANDOM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

MICK MULVANEY

DIRECTOR, OFFICE OF MANAGEMENT AND BUDGET

MICHAEL KRATSIOS DEPUTY ASSISTANT TO THE PRESIDENT

OFFICE OF SCIENCE AND TECHNOLOGY POLICY

SUBJECT: TY 20-9 Administration Research and Development Bulgo

American leadership in science and rechnology is critical to achieving highest priorities: national security, economic growth, and job creation combined with free-market capitalism have driven, and will continue technological breakthroughs. American inventions have fundamentally a framen history: the incondescent light built, the similane, sotellite davigation improved the lives of millions of Americans and billions around the woladvances, Pateral finding of research and developmen. (R&D) pre infrastructure can play a emoial supporting role

this memorandum highlights the Administration's R&O priority areas for Budget submissions to the Office of Management and Budget (CMB). I receive special focus in agency budget requests. This manuscandum dis-guidance on behaving new primities with existing demands, encouraging R&D investments that best serve the American people and are budget neath

R&D Priority Areas

American Military Strengtry

The American wartigites requires state-of the art tools and technologies number of emerging threats. Agencies should invest in R&D that can supp future, including in technologies related to the development of missile a modern strategie deterrent, hypersonia weapons and defenses, automosystems, trusted microelectronics, and future computing capabilities. History investments in military technology have led to the development of breekthe have improved lives beyond the battlefield. While military RXOD should serfirst and foremest, the Administration recognizes the contributions of development of tremendously useful divid applications. Accordingly, we are deal-use practical to be becaused for Pratural non-relitory advantagements.



EXECUTIVE OFFICE OF THE PRESIDENT



July 31, 2013

MEMORANDOM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

MICK MULVANEY DIRECTOR, OFFICE OF MANAGEMENT AND BUDGET

MICHAEL KRATSIOS - SELC-S DIPUTY ASSISTANCED FOR PRESIDENT OFFICE OF SCHINGE AND TECHNOLOGY POLICY

SUBJECT: TY 2020 Administration Research and Development Undget Profittee

The Divital States is a nation of flinkers, inventors, and an apparetuse. Empowered by asmarket capitalism and driven by hold ideas. Americans created an ecosystem of importation that is forcing of the world, who many science and trained by and nothing for Nation prospersus and arring America hough. In minimize of closerin light or people's houses, plantal militaritie of knowledges in people's periodest, and published on the Manna and hought histories of a Codi-

Judging on a contribution of Ferenti research and development (R&O) invasioning America will risp be the himon that leads in today's emerging technologies, from arthroid intelligence (AI) and quantum computing, to biotechnology, advanced wireless communications, and space commercialization.

Federal R&D dollars focused primerly on basic and enhy-range applied research, paired with tagestal disciplicities, and invocame in sections, editioning, or precing, and enhantidis-(STDP) electric and with their development, will straightful be Milio's furnation has and political as three Section impossibility by greats, around processing seafundational and in

This memorandum highlights the Administration's R&D produces and provides gradator to agencies as they commutate their Pisca. Year 2020 purget submissions. This memorratum also details priority americas to effectively everage R&D resources, including R&D worldbace and

OMB/OSTP R&D Priority Memos (FY19 & FY20)



NASA Earth Science Applied Sciences Program **Agility & Flexibility** 

Replication

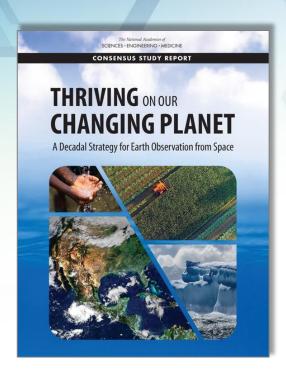
**Private Sector** 

**Communications** 

**Earth Decadal Survey** 



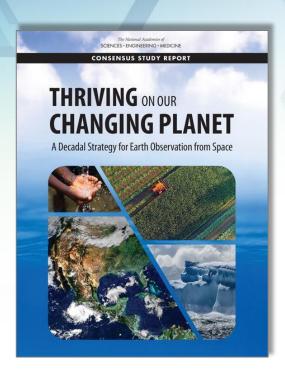




Final Report Released 2019

#### **ELEMENTS**TO FEDERALESTRATEGY TO STATE OF THE PROPERTY OF T Embrace **Innovative Methodologies** for Integrated Science/Applications **Commit to Sustained Science and Applications** II. III. **Amplify the Cross-Benefit of Science and Applications** IV. **Leverage External Resources and Partnerships** Institutionalize **Programmatic Agility and Balance** V. VI. Exploit External Trends in Technology and User Needs **Expand Use of Competition** VII. Pursue Ambitious Science, Despite Constraints VIII.





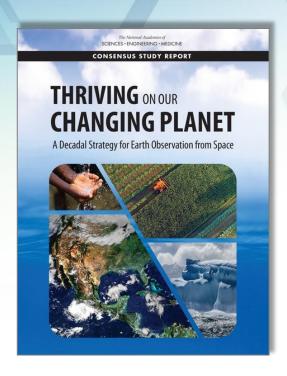
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"[Programs] with both science and applications elements need to explicitly identify the connection, and define opportunities to amplify the cross-benefit, and organization structures and processes need to be adapted when possible to integrate, rather than segregate, science and operations/applications"

"Agility in programmatic structures, and in the authorities of staff who implement programs, is essential to respond to new discoveries and emerging needs ..."





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**TABLE 3.2** Science and Applications Priorities for the Decade 2017-2027—The Science and Applications Portion of the Full Science and Applications Traceability Matrix (SATM) in Appendix B

#### GLOBAL HYDROLOGICAL CYCLES AND WATER RESOURCES PANEL

Societal or Science Question/Goal	Earth Science/Applications Objective	Science/ Applications Importance
QUESTION H-1. How is the water cycle changing? Are changes in evapotranspiration and precipitation accelerating, with greater rates of evapotranspiration and thereby precipitation, and how are these changes expressed in the space-time distribution of rainfall, snowfall, evapotranspiration, and the frequency and magnitude of extremes such as droughts and floods?	<b>H-1a.</b> Develop and evaluate an integrated Earth system analysis with sufficient observational input to accurately quantify the components of the water and energy cycles and their interactions, and to close the water balance from headwater catchments to continental-scale river basins.	Most Important
	H-1b. Quantify rates of precipitation and its phase (rain and snow/ice) worldwide at convective and orographic scales suitable to capture flash floods and beyond.	Most Important
	<b>H-1c.</b> Quantify rates of snow accumulation, snowmelt, ice melt, and sublimation from snow and ice worldwide at scales driven by topographic variability.	Most Important



NASA Earth Science Applied Sciences Program **Agility & Flexibility** 

Replication

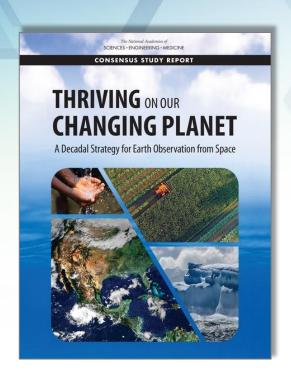
**Private Sector** 

**Communications** 

**Earth Decadal Survey** 







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### **Early-Stage Ideas**

#### **Opportunities for future investment (Chapter 4)**

"... The final missing piece of applications research in the agencies is the very initial phase of creating applications—supporting studies that have an idea about how an application might work, and then attempting to create a community for it, and demonstrate its utility.

To expand the potential applications of Earth observations, it would be beneficial to support "proof-of-concept" application studies. Investigators could propose research to evaluate potential data applications, whether a preliminary idea, or a more mature approach to expand the use of remote sensing data."



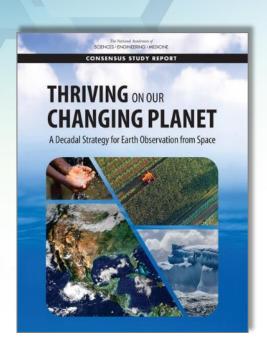


### **Strategy Element 5**

"NASA, NOAA, and USGS will need to make both large and small programmatic adjustments over short time periods. *Agility* in programmatic structures, and in the authorities of staff who implement programs, is essential to respond to new discoveries and emerging needs, particularly in the context of resource constraints. At the same time, achieving and maintaining *programmatic balance* is critical to successful programs.

"Agility and balance do not emerge naturally in organizations. They must be explicitly built into the cultures and processes or they risk being overcome by bureaucracy."



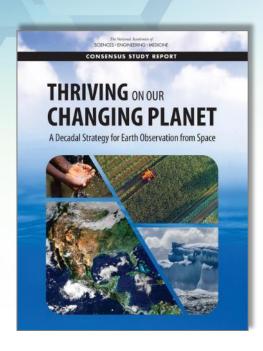


### **Strategy Element 4**

"NASA, NOAA, and USGS have long-established partnerships with non-U.S. space agencies and other organizations, which have already proven highly valuable in bringing additional resources to address their missions ... "

"Today, there is a strong need to build on and extend those partnerships, and to bring in innovative new partnerships ..."





### **Strategy Element 6**

"For NASA, NOAA, and USGS, a successful process for exploiting external trends might include, at minimum, a survey of:

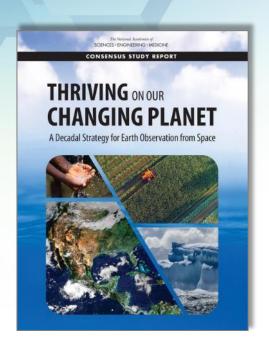
- a) advances in scientific methodologies from outside these agencies;
- b) commercial methods for characterizing the diverse applications and information end-uses of data;\*

...

- f) non-traditional partnerships such as philanthropists and non-profits;
- g) innovation in public-private partnerships"

<sup>\*</sup> For example, Item (b) reflects the fact that there are so many end-uses of NASA/NOAA/USGS data that the agencies no longer can simply track straightforward metrics like grants or website data requests to know how their data are used.





#### **Strategy Element 2**

"Accelerated applications: Accelerating the conversion of science into societal benefits amplifies the societal impact. Candidates include: a) applications included from the early stages of observation planning and development, b) rapid applications prototyping, c) rapid transition from science to applications, and d) promoting the science of applications, to advance applications methodologies (Dozier and Gail, 2009)."